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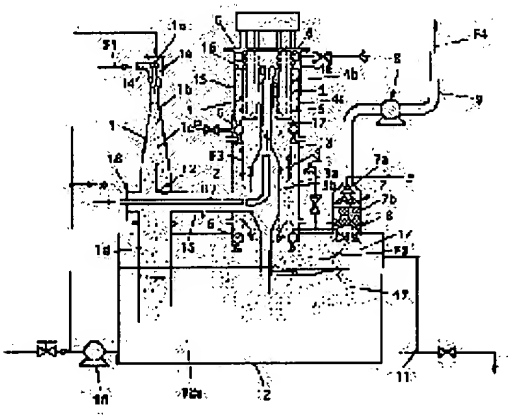
(71)Applicant : KANKEN TECHNO KK

(72)Inventor : IMAMURA KEIJI

(54) METHOD FOR REMOVING SEMICONDUCTOR PRODUCTION WASTE GAS AND DEVICE THEREFOR

(57)Abstract:

PURPOSE: To subject any waste gas to a harm removal treatment to the concentration of not more than the allowable amount of its harmful components by washing and removing dust produced by thermal decomposition of a semiconductor production waste gas which has been washed with water.



CONSTITUTION: Waste gas F1 discharged from a semiconductor producing device is washed with high pressure water in mist sprayed from a spray nozzle 1e to remove water soluble components or hydrolyzed components. Thereafter, washed waste gas F2 enters a heat exchanger body 3b and exchanges heat energy with high temp. decomposed gas F3 decomposed by oxidation in a thermal decomposition device through the wall of the heat exchanger body 3b, and enters an oxidizing thermal decomposition zone of the thermal decomposition device 4. The washed waste gas F2 falls along the surface of an electrical rod heater 5 and is thermally decomposed. The high temp. decomposed gas '5 generates a lot of dust 17 as the oxidation treatment proceeds to accumulate it on the outer periphery of the heat exchanger body 3b. The accumulated dust 17 is removed by a dust discharge device 6.

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CLAIMS

[Claim(s)]
[Claim 1] The semi-conductor manufacture exhaust gas damage elimination approach which decomposes the pyrolysis component gas of rinsing exhaust gas with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas which occurred by the pyrolysis, and is made into clarification exhaust gas after removing said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing.
[Claim 2] After removing said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing, In the semi-conductor manufacture exhaust gas damage elimination approach which decomposes the pyrolysis component gas of rinsing exhaust gas with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas which occurred by the pyrolysis, and is made into clarification exhaust gas The semi-conductor manufacture exhaust gas damage elimination approach characterized by removing intermittently the dust which generated at the time of thermal decomposition while heating rinsing exhaust gas by heat exchange with the pyrolyzed elevated-temperature exhaust gas, and was accumulated in the thermal decomposition zone at least by compression injection gas.
[Claim 3] The water scrubber from which the water-soluble-materials gas or/and hydrolysis component gas in the semi-conductor manufacture exhaust gas of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least are removed, The thermal decomposition equipment which pyrolyzes the pyrolysis component gas in said rinsing exhaust gas, and the heat exchanger which heats said rinsing exhaust gas with said elevated-temperature pyrolysis exhaust gas, The spray equipment from which the dust in the elevated-temperature pyrolysis exhaust gas which occurred by the pyrolysis is removed, The dust exhaust which is installed in thermal decomposition equipment or thermal decomposition equipment, and a heat exchanger, blows compression injection gas into the interior of equipment, and discharges intermittently thermal decomposition equipment or thermal decomposition equipment, and the dust accumulated in the interior of a heat exchanger, Semi-conductor manufacture exhaust gas damage elimination equipment characterized by consisting of a water scrubber and air supply tubing which mixes oxygen in rinsing exhaust gas in process of either between thermal decomposition equipment.
[Claim 4] Semi-conductor manufacture exhaust gas damage elimination equipment according to claim 3 characterized by being arranged around the exhaust port of the rinsing exhaust gas with which the heating means of thermal decomposition equipment was formed at the cylindrical heater crooked in the shape of U character, and the preheating of two or more cylindrical heaters was carried out in the heat exchanger within casing of thermal decomposition equipment.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the compact damage elimination equipment which generally used the corrosive metaled effective damage elimination approach and the metaled corrosive approach concerned of intense exhaust gas including 1 which makes it detrimentally and poisonous to semi-conductor manufacture exhaust gas, especially the body, and has inflammability and explosivility, and has hydrolysis nature, and water solubility and pyrolysis nature thru/or two or more kinds of component gas.
[0002]
[Description of the Prior Art] It is made detrimentally and poisonous to the body, and has inflammability and explosivility, and the approach of emitting to atmospheric air as it is, after diluting corrosive intense semi-conductor manufacture exhaust gas with a lot of nitrogen gas to a metal in general, making it exhaust gas concentration become below a lower explosive limit and mixing with the air of an overlarge further was taken. Environmental administration becomes severe with the rise of recognition to environmental protection, the above atmospheric-air emission approaches serve as a direction regulated severely, and semi-conductor manufacture exhaust gas must also stop however, also having to eliminate them positively this time.
[0003] Then, as an approach of eliminating a damage positively, it is the scrubber method which used ** basicity or an oxidizing quality (generally alkali like caustic alkali of sodium) drug solution, and washing processing of the semi-conductor manufacture exhaust gas is carried out.
** Pass the layer of the adsorbent combined with object exhaust gas and a chemistry target, and carry out adsorbent removal.
** Introduce and process exhaust gas in the flame ambient atmosphere of a lot of hydrogen gas as a dry type heating oxidation damage elimination method.
** Various methods, such as a method which it introduces [method] and makes gas, such as exhaust gas, oxygen (air), and nitrogen, decompose into [same] the tubed electric heater as an oxidation-in-the-gas-phase heating method so that it may become concentric circular, are proposed until now.
[0004] Though these methods had a certain features, in addition, the trouble described below is held and much more improvement was called for from the user side. Namely, although said method ** is fit for the offgas treatment of large airflow The applicability is ****** (TLV is called hereafter.) which is limited to the exhaust gas of hydrolysis nature, cannot do any effectiveness so to the exhaust gas of un-hydrolyzing nature fundamentally, and is defined globally. The most difficult work lowers an exhaust gas component to the following concentration, and the present condition is mixing further with the air of an overlarge the processing exhaust gas discharged by concentration usually higher than said TLV, and carrying out atmospheric-air emission.
[0005] It is the approach of carrying out introductory processing of the gas, there is a limitation in adsorption capacity, method ** needs column exchange for column-like ****** according to capacity, and the burdens of a high running cost including abandonment of following risk on the change activity and an adsorbent become a problem.
[0006] Although method ** is the approach of making exhaust gas oxidizing in a hydrogen flame, although this is evaluated about the integrity and throughput of processing, when it is attached to the hydrogen flame handling nature in a semi-conductor manufacture site, and the anxiety from safety is not avoided but safety is thought as important, it has the problem that a running cost rises.
[0007] Although method ** uses a cylinder heating heater, this thing is difficult for a limitation to be in heat transfer and offgas treatment airflow to exhaust gas, and to satisfy the various requirements of a semi-conductor manufacture site. Moreover, while being unable to perform removal correspondence of hydrolysis nature exhaust gas, acid exhaust

gas; or basic exhaust gas, there is a trouble on use that processing of generating dust cannot fully carry out over long duration.

[0008]

[Problem(s) to be Solved by the Invention] The solution technical problem of this invention is being able to carry out certainly , follow damage elimination of the exhaust gas call for in a semi-conductor manufacture site moreover at the many various conditions in semi-conductor manufacture as well as the ability work [insurance and / in / a running cost is cheap and / continuous use] stably over a long time , and being able to be made to carry out damage elimination processing of any exhaust gas to the concentration below TLV of these components .

[0009]

[Means for Solving the Problem] After the 1st of this invention approach removes said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas (F1) of "water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing, it decomposes the pyrolysis component gas of rinsing exhaust gas (F2) with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas (F3) which occurred by the pyrolysis, and is taken as clarification exhaust gas (F4).

[0010] Thereby, it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site.

[0011] After the 2nd of this invention approach removes said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas (F1) of "water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing, In the semi-conductor manufacture exhaust gas damage elimination approach which decomposes the pyrolysis component gas of rinsing exhaust gas (F2) with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas (F3) which occurred by the pyrolysis, and is made into clarification exhaust gas (F4) While heating rinsing exhaust gas (F2) by heat exchange with the pyrolyzed elevated-temperature exhaust gas (F3), it generates at the time of thermal decomposition, and it is characterized by" thing which removes intermittently the dust (17) accumulated in the thermal decomposition zone at least by compression injection gas.

[0012] There is no ** as it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs as mentioned above in a semi-conductor manufacture site according to this. Heat recovery can also become possible, power consumption of an electric heater (5) can be lessened, and a running cost can be held down at a low price. And the dust (17) generated with thermal decomposition of washing exhaust gas (F2) can be eliminated from a thermal decomposition zone at least, the lock out accident by dust (17) can be prevented, and it can work stably over a long time in continuous use.

[0013] The semi-conductor manufacture exhaust gas damage elimination equipment concerning this invention ** The water scrubber from which the water-soluble-materials gas or/and hydrolysis component gas in the semi-conductor manufacture exhaust gas (F1) of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least are removed (1), ** The thermal decomposition equipment which pyrolyzes the pyrolysis component gas in said rinsing exhaust gas (F2) (4), ** The heat exchanger which heats rinsing exhaust gas (F2) with said elevated-temperature pyrolysis exhaust gas (F3) (3), ** The spray equipment from which the dust (17) in the elevated-temperature pyrolysis exhaust gas (F3) which occurred by the pyrolysis is removed (7), ** It is installed in thermal decomposition equipment (4) or thermal decomposition equipment (4), and a heat exchanger (3). The dust exhaust which discharges intermittently the dust (17) which blew compression injection gas (16) into the interior of equipment, and was accumulated in the interior of thermal decomposition equipment (4) or thermal decomposition equipment (4), and a heat exchanger (3) (6), ** It is characterized by consisting of air supply tubing (2) which mixes oxygen in rinsing exhaust gas (F2) in process of either between a water scrubber (1) and thermal decomposition equipment (4).

[0014] It can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which can remove the water-soluble-materials gas or/and hydrolysis component gas in semi-conductor manufacture exhaust gas (F1) with a water scrubber (1), can pyrolyze the pyrolysis component gas in rinsing exhaust gas (F2) with thermal decomposition equipment (4) by this, and occurs in a semi-conductor manufacture site. Furthermore, since heat recovery also becomes possible by the heat exchanger (3), power consumption of an electric heater (5) can be lessened and a running cost can be held down at a low price. Since the dust (17) in elevated-temperature pyrolysis exhaust gas (F3) is removable with spray equipment (7), dust (17) is not contained in the clarification exhaust gas (F4) by which atmospheric-air emission is carried out but various component gas is moreover falling below to TLV by said processing, an environment is not spoiled by atmospheric-air emission. Moreover, since thermal decomposition equipment (4) or thermal decomposition equipment (4), and the dust (17) accumulated in the interior of a heat exchanger (3) are intermittently discharged with

the dust exhaust (6), the lock out accident by dust (17) can be prevented, and it can work stably over a long time in continuous use.

[0015] Claim 4 is what limited the arrangement structure of a cylindrical heater (5), and the heating means of "thermal decomposition equipment (4) is formed at the cylindrical heater (5) crooked in the shape of U character. Two or more cylindrical heaters (5) are characterized by" thing arranged around the exhaust port of the rinsing exhaust gas (F2) by which the preheating was carried out by the heat exchanger (3) within casing (4a) of thermal decomposition equipment (4).

[0016] Thereby, unlike conventional method ** which used the cylinder heating heater, a cylindrical heater (5) can be contacted in direct rinsing exhaust gas (F2), high heat transfer to rinsing exhaust gas (F2) can be attained, it can be possible from small airflow to large airflow processing, and the various operation conditions of a semi-conductor manufacture site can be satisfied.

[0017]

[Example] Hereafter, this invention equipment is explained in full detail according to an illustration example. Drawing 1 is the outline sectional view showing the flow of this invention equipment. In drawing 1 , (1) is a water scrubber, it has connected with the semiconductor fabrication machines and equipment of works by the duct (14), it is used in the residual gas and the semi-conductor production process which were used in the semi-conductor production process, and the semi-conductor manufacture exhaust gas (F1) with which the exhaust gas which passed through the various chemical change gathered is introduced here.

[0018] The water scrubber (1) is set up on the water tank (12), and consists of the straight sections (1d) which follow the skirt-board section (1c) list in which the lower part has spread at the skirt-board section (1c) following the bosh section (1a) from which the lower part was extracted, the throat section (1b) following the bosh section (1a), and the straight section (1b). It is immersed in the reservoir water (12a) of said water tank (12) by the straight section (1d). The spray nozzle (1e) is installed in the head-lining part of the bosh section (1a), and injects water toward the throat section (1b).

[0019] The circulating water pump (10) is installed between the spray nozzle (1e) and the water tank (12), and the reservoir water (12a) in a water tank (12) is pumped up to a spray nozzle (1e). Moreover, a city water is supplied to said circulating water pump (10), and the reservoir water (12a) and said city water of a water tank (12) are mixed and pumped up.

[0020] It is installed in one on the heat exchanger (3), and both (3) and (4) adjoin a water scrubber (1), and thermal decomposition equipment (4) is installed on the water tank (12). The heat exchanger (3) is constituted from a heat insulator (13) ****(ed) by the periphery of cylindrical casing (3a) by the heat exchange body (3b) list contained inside cylindrical casing (3a) and cylindrical casing (3a), and the body of a heat exchanger implement (3b) is open for free passage with the straight section (1d) of a water scrubber (1) with the communicating tube (15).

[0021] Thermal decomposition equipment (4) consists of heat insulators (13) ****(ed) by the cylindrical heater (4b) list currently installed in cylindrical casing (4a) and casing (4a) at the periphery of cylindrical casing (4a). The upper limit opening part of said heat exchanger body (3b) is carrying out opening to a part for the core of the installation of a cylindrical heater (4b), and the rinsing exhaust gas (F2) by which the preheating was carried out is discharged by the thermal decomposition zone of a cylindrical heater (4b) installation part.

[0022] The dust exhaust (6) is the thing of the shape of a nozzle connected to the source of high pressure gas, and high-pressure jet gas (16) spouts it from the opening. Although inert gas like nitrogen gas will generally be used for the high pressure gas spurt out inside equipment when thermal decomposition exhaust gas (F3) reacts to the oxygen and the explosion target in air, air will be blown when it does not have explosivility. In this example, since thermal decomposition exhaust gas (F3) is already decomposed and it does not have explosivility, the compressed air is used. In this example, in the base opening partial list of the head-lining part of thermal decomposition equipment (4), an interstitial segment, and a heat exchanger (3), the installation of the dust exhaust (6) is the entry of spray equipment (7), and spouts compression jet gas (16) downward. The installation of the dust exhaust (6) is not restricted to an above location, but can install now only a number required for a need part.

[0023] Spray equipment (7) is installed in the head-lining part of a water tank (12), and the thermal decomposition exhaust gas (F3) which flowed in the water tank (12) from base opening of a heat exchanger (3) flows through the space between the head-lining part of a water tank (12), and the water surface. Spray equipment (7) has the structure where many baffles (7b) and spray nozzles (7a) were built in. The jet pipe (9) is installed in the outlet of spray equipment (7), and the ventilating fan (8) is installed in the middle.

[0024] As a semi-conductor manufacture exhaust gas (F1), although not restricted to this, of course, the simple substances of SiH2Cl2, gas like B-2 H6 and acidity like HCl, HF, and NH3, or basic gas or such at least two mixture are mentioned, for example as hydrolysis nature gas.

[0025] A deer is carried out, the semi-conductor manufacture exhaust gas (F1) discharged from the semi-conductor manufacturing facility is introduced into the bosh section (1a) through a duct (14), and the high-pressure water of the shape of a fog which blew off from the spray nozzle (1e) washes. Compression accelerating of the high-pressure water which blew off from the spray nozzle (1e) is carried out in a rat tail and the throat section (1b) in the bosh section (1a), a gas liquid contact is effectively made with semi-conductor manufacture exhaust gas (F1), and the water-soluble materials or the hydrolysis component in semi-conductor manufacture exhaust gas (F1) is decomposed in contact with spray water, or it is dissolved and removed.
[0026] Water supply to the spray nozzle (1e) of a water scrubber (1) is performed by pumping up the reservoir water (12a) in a water tank (12) with said circulating water pump (10). In this case, in SiH2Cl2 contained in semi-conductor manufacture exhaust gas (F1), while hydrolyzing and making HCl generate, it produces and cheats out of [SiH2O] X to coincidence, and it is absorbed by spray water. The treated water of a wastewater duct (11) to tales doses is eliminated from a water tank (12) to overflow or a pars basilaris ossis occipitalis, supplying always new water (city water) to a circulating water pump (10) to a water tank (12). In addition, air supply tubing (2) is inserted in the heat exchanger body (3b) of a heat exchanger (3) through the communicating tube (15) from the maintenance door (18) formed in the straight section (1d) of a water scrubber (1), and air required for oxidation thermal decomposition with an air supply pump (not shown) is supplied to washing exhaust gas, and it mixes. The concentration of the washing exhaust gas at this time (F2) is thinned below at the maximum allowable concentration of explosion.
[0027] Said air supply tubing (2) may be inserted to the entry part of a heat exchanger body (3b), as a continuous line shows, as an imaginary line shows, it may penetrate and arrange a heat exchanger body (3b), and you may make it mix air in the parts of the communicating tube (15) thru/or the straight section (1d) conversely. In order to make mixing of washing exhaust gas (F2) and air fully perform, it is good to mix by the straight section (1d) side, but if it thinks from the field of safety, it is desirable to penetrate and arrange a heat exchanger body (3b).
[0028] The rinsing exhaust gas (F2) washed with the water scrubber (1) enters in the heat exchanger body (3b) of a heat exchanger (3) via the communicating tube (15). Here, while being mixed with air as mentioned above, transfer of heat energy is performed through the container wall of the pyrolysis gas (F3) in which oxidative degradation was carried out by heating at high temperature with the thermal decomposition equipment (4) in the equipment upper part, and a heat exchanger body (3b), and where a preheating temperature up is carried out, it is discharged from upper limit opening of a heat exchanger body (3b), and goes into the oxidation thermal decomposition zone of thermal decomposition equipment (4).
[0029] As a heating means of this invention, the electric cylindrical heater (5) curved in the shape of [two or more] U character is used, along this front face, the washing exhaust gas (F2) processed descends, and a pyrolysis is carried out. The electric cylindrical heater (5) is curved in the shape of U character as mentioned above, since two or more cylindrical heaters (5) are arranged around the exhaust port of a heat exchanger body (3b) within casing (4a) of thermal decomposition equipment (4), contact to the washing exhaust gas (F2) by which the preheating was carried out to the electric cylindrical heater (5) is fully performed, and a pyrolysis completes it to the inside of a short time here. Therefore, the tooth space of an oxidation thermal decomposition zone can be made small.
[0030] The oxidized pyrolysis exhaust gas (F3) will generate a lot of dust (17), will be deposited on the periphery of the heat exchanger body (3b) with which this is installed under the periphery of an electric cylindrical heater (5), or the electric cylindrical heater (5), and it removes deposition dust (17) with the dust exhaust (6) so that it may mention later.
[0031] As mentioned above, rinsing exhaust gas (F2) descends toward a heat exchanger (3) from thermal decomposition equipment (4), generating a lot of dust (17) with advance of oxidation treatment, and heats the rinsing exhaust gas (F2) which is going up the inside of a heat exchanger body (3b) from the periphery through the container wall of a heat exchanger body (3b). Thus, the thermal decomposition exhaust gas (F3) which finished heat exchange enters in a water tank (12) from the opening of a heat exchanger (3), and is introduced in spray equipment (7) through the space between the head-lining side of a water tank (12), and the water surface. Installation of the decomposition exhaust gas (F3) to spray equipment (7) is performed by the suction effect of a ventilating fan (8).
[0032] Although said some of dust (17) carries out adhesion deposition into an electric cylindrical heater (5) and a heat exchanger (3), most descends with pyrolysis exhaust gas (F3), and the most pours and sinks on the reservoir water (12a) in a water tank (12).
[0033] It will rinse effectively with the water spray and the baffle (7b) from a spray nozzle (7a), and heat will be taken, and the decomposition exhaust gas (F3) containing the dust (17) introduced into spray equipment (7) will serve as low temperature, will turn into clarification low-temperature exhaust gas (F4), and atmospheric-air emission will be carried out from a jet pipe (9).
[0034] In addition, in this invention equipment, as mentioned above, oxide dust is generated mainly inside thermal

decomposition equipment (4), adhesion deposition is carried out inside thermal decomposition equipment (4) and a heat exchanger (3) with time amount, and there is a danger of blockading passage during an oxidation thermal decomposition reaction. The dust exhaust (6) formed in the high pressure gas injection nozzle as mentioned above as the cure is installed in the upper limit of thermal decomposition equipment (4), and the opening of a heat exchanger (3), high-pressure air or nitrogen gas can be intermittently blown off inside thermal decomposition equipment (4) and a heat exchanger (3), deposition dust (17) is dropped, and it drops into a water tank (12). The dropped dust (17) is usually fines-like, and although it is floating on the water front face at the beginning, it comes to distribute it in reservoir water (12a) with time amount. Some reservoir water (12a) in a water tank (12) is discharged out of a water tank (12) through a wastewater duct (11). In this case, a filter (not shown) is installed in front of a wastewater duct (11) if needed, and you may make it remove dust as a solid.

[0035] Moreover, with this invention equipment, rinsing exhaust gas (F2) can be beforehand heated by installation of a heat exchanger (3), heat recovery can become possible, and the heat energy burden placed on an electric heater (5) can be reduced sharply. When carrying out damage elimination processing of semi-conductor manufacture exhaust gas (F1) with this invention equipment, although the skin temperature of an electric heater (5) is set as 600-900 degrees C, by the heat exchanger (3), 20 - 30% of saving of use energy can be attained, and the running cost of semi-conductor manufacture can usually be reduced.

[0036] (Example of an experiment) As the ratio of the surface area / thermal decomposition zone wall surface area of an electric heater (5) was set as 1 and shown in the following table, it experimented in SiH4 of various concentration with various airflow. It checked that SiH4 could be eliminated below to the TLV in the following operating conditions to the designed damage elimination equipment in any case.

<<table 1>>

introductory SiH4 concentration Introductory gas all airflow (exhaust gas + air) Heater temperature Concentration of SiH4 in exhaust gas (ppm) (L/min) (degree C) (ppm) 500 1,000 850 <5 1,000 500 650 <5 3,000 1,000 900 <5 5,000 500 800 <5 [0037]

[Effect of the Invention] Since this invention approach decomposes the pyrolysis component gas of rinsing exhaust gas with heating, carries out the rinsing removal of the dust in the pyrolysis exhaust gas which occurred by the pyrolysis and makes it clarification exhaust gas after it removes said water-soluble-materials gas or/and hydrolysis component gas by rinsing for the semi-conductor manufacture exhaust gas of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least, it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site. Furthermore, since compression injection gas removes intermittently the dust which could lessen power consumption, and could hold down the running cost at a low price, and was accumulated in the thermal decomposition zone at least since rinsing exhaust gas was heated by heat exchange with the pyrolyzed elevated-temperature exhaust gas, the lock out accident by the dust of a thermal decomposition zone can be prevented, and it can set to continuous use again, and can work stably over a long time. Moreover, it not only can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site, but [since semi-conductor manufacture exhaust gas damage elimination equipment is the above configurations,] it not only can attain reduction of a running cost, dust[non-]-izing of the clarification exhaust gas by which atmospheric-air emission is carried out, and TLV, but stable operation becomes possible for a long time [continuous]. Moreover, by devising the arrangement structure of a cylindrical heater, high heat transfer to rinsing exhaust gas can be attained, and there is an advantage that it can be possible from small airflow to large airflow processing, and the various operation conditions of a semi-conductor manufacture site can be satisfied.

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TECHNICAL FIELD

[Industrial Application] This invention relates to the compact damage elimination equipment which generally used the corrosive metaled effective damage elimination approach and the metaled corrosive approach concerned of intense exhaust gas including 1 which makes it detrimentally and poisonous to semi-conductor manufacture exhaust gas, especially the body, and has inflammability and explosivility, and has hydrolysis nature, and water solubility and pyrolysis nature thru/or two or more kinds of component gas.

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PRIOR ART

[Description of the Prior Art] It is made detrimentally and poisonous to the body, and has inflammability and explosivility, and the approach of emitting to atmospheric air as it is, after diluting corrosive intense semi-conductor manufacture exhaust gas with a lot of nitrogen gas to a metal in general, making it exhaust gas concentration become below a lower explosive limit and mixing with the air of an overlarge further was taken. Environmental administration becomes severe with the rise of recognition to environmental protection, the above atmospheric-air emission approaches serve as a direction regulated severely, and semi-conductor manufacture exhaust gas must also stop however, also having to eliminate them positively this time.

[0003] Then, as an approach of eliminating a damage positively, it is the scrubber method which used ** basicity or an oxidizing quality (generally alkali like caustic alkali of sodium) drug solution, and washing processing of the semi-conductor manufacture exhaust gas is carried out.

** Pass the layer of the adsorbent combined with object exhaust gas and a chemistry target, and carry out adsorbent removal.

** Introduce and process exhaust gas in the flame ambient atmosphere of a lot of hydrogen gas as a dry type heating oxidation damage elimination method.

** Various methods, such as a method which it introduces [method] and makes gas, such as exhaust gas, oxygen (air), and nitrogen, decompose into [same] the tubed electric heater as an oxidation-in-the-gas-phase heating method so that it may become concentric circular, are proposed until now.

[0004] Though these methods had a certain features, in addition, the trouble described below is held and much more improvement was called for from the user side. Namely, although said method ** is fit for the offgas treatment of large airflow The applicability is ****** (TLV is called hereafter.) which is limited to the exhaust gas of hydrolysis nature, cannot do any effectiveness so to the exhaust gas of un-hydrolyzing nature fundamentally, and is defined globally. The most difficult work lowers an exhaust gas component to the following concentration, and the present condition is mixing further with the air of an overlarge the processing exhaust gas discharged by concentration usually higher than said TLV, and carrying out atmospheric-air emission.

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[0006] Although method ** is the approach of making exhaust gas oxidizing in a hydrogen flame, although this is evaluated about the integrity and throughput of processing, when it is attached to the hydrogen flame handling nature in a semi-conductor manufacture site, and the anxiety from safety is not avoided but safety is thought as important, it has the problem that a running cost rises.

[0007] Although method ** uses a cylinder heating heater, this thing is difficult for a limitation to be in heat transfer and offgas treatment airflow to exhaust gas, and to satisfy the various requirements of a semi-conductor manufacture site. Moreover, while being unable to perform removal correspondence of hydrolysis nature exhaust gas, acid exhaust gas, or basic exhaust gas, there is a trouble on use that processing of generating dust cannot fully carry out over long duration.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention approach decomposes the pyrolysis component gas of rinsing exhaust gas with heating, carries out the rinsing removal of the dust in the pyrolysis exhaust gas which occurred by the pyrolysis and makes it clarification exhaust gas after it removes said water-soluble-materials gas or/and hydrolysis component gas by rinsing for the semi-conductor manufacture exhaust gas of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least, it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site. Furthermore, since compression injection gas removes intermittently the dust which could lessen power consumption, and could hold down the running cost at a low price, and was accumulated in the thermal decomposition zone at least since rinsing exhaust gas was heated by heat exchange with the pyrolyzed elevated-temperature exhaust gas, the lock out accident by the dust of a thermal decomposition zone can be prevented, and it can set to continuous use again, and can work stably over a long time. Moreover, it not only can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site, but [since semi-conductor manufacture exhaust gas damage elimination equipment is the above configurations,] it not only can attain reduction of a running cost, dust[non-]-izing of the clarification exhaust gas by which atmospheric-air emission is carried out, and TLV, but stable operation becomes possible for a long time [continuous]. Moreover, by devising the arrangement structure of a cylindrical heater, high heat transfer to rinsing exhaust gas can be attained, and there is an advantage that it can be possible from small airflow to large airflow processing, and the various operation conditions of a semi-conductor manufacture site can be satisfied.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The solution technical problem of this invention is being able to carry out certainly , follow damage elimination of the exhaust gas call for in a semi-conductor manufacture site moreover at the many various conditions in semi-conductor manufacture as well as the ability work [insurance and / in / a running cost is cheap and / continuous use] stably over a long time , and being able to be made to carry out damage elimination processing of any exhaust gas to the concentration below TLV of these components .

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MEANS

[Means for Solving the Problem] After the 1st of this invention approach removes said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas (F1) of "water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing, it decomposes the pyrolysis component gas of rinsing exhaust gas (F2) with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas (F3) which occurred by the pyrolysis, and is taken as clarification exhaust gas (F4).
[0010] Thereby, it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs in a semi-conductor manufacture site.
[0011] After the 2nd of this invention approach removes said water-soluble-materials gas or/and hydrolysis component gas for the semi-conductor manufacture exhaust gas (F1) of "water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least by rinsing, In the semi-conductor manufacture exhaust gas damage elimination approach which decomposes the pyrolysis component gas of rinsing exhaust gas (F2) with heating, carries out rinsing removal of the dust in the pyrolysis exhaust gas (F3) which occurred by the pyrolysis, and is made into clarification exhaust gas (F4) While heating rinsing exhaust gas (F2) by heat exchange with the pyrolyzed elevated-temperature exhaust gas (F3), it generates at the time of thermal decomposition, and it is characterized by" thing which removes intermittently the dust (17) accumulated in the thermal decomposition zone at least by compression injection gas.
[0012] There is no ** as it can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which occurs as mentioned above in a semi-conductor manufacture site according to this. Heat recovery can also become possible, power consumption of an electric heater (5) can be lessened, and a running cost can be held down at a low price. And the dust (17) generated with thermal decomposition of washing exhaust gas (F2) can be eliminated from a thermal decomposition zone at least, the lock out accident by dust (17) can be prevented, and it can work stably over a long time in continuous use.
[0013] The semi-conductor manufacture exhaust gas damage elimination equipment concerning this invention ** The water scrubber from which the water-soluble-materials gas or/and hydrolysis component gas in the semi-conductor manufacture exhaust gas (F1) of water-soluble-materials gas or hydrolysis component gas which contains either and pyrolysis component gas at least are removed (1), ** The thermal decomposition equipment which pyrolyzes the pyrolysis component gas in said rinsing exhaust gas (F2) (4), ** The heat exchanger which heats rinsing exhaust gas (F2) with said elevated-temperature pyrolysis exhaust gas (F3) (3), ** The spray equipment from which the dust (17) in the elevated-temperature pyrolysis exhaust gas (F3) which occurred by the pyrolysis is removed (7), ** It is installed in thermal decomposition equipment (4) or thermal decomposition equipment (4), and a heat exchanger (3). The dust exhaust which discharges intermittently the dust (17) which blew compression injection gas (16) into the interior of equipment, and was accumulated in the interior of thermal decomposition equipment (4) or thermal decomposition equipment (4), and a heat exchanger (3) (6), ** It is characterized by consisting of air supply tubing (2) which mixes oxygen in rinsing exhaust gas (F2) in process of either between a water scrubber (1) and thermal decomposition equipment (4).
[0014] It can respond to damage elimination of all kinds of semi-conductor manufacture exhaust gas which can remove the water-soluble-materials gas or/and hydrolysis component gas in semi-conductor manufacture exhaust gas (F1) with a water scrubber (1), can pyrolyze the pyrolysis component gas in rinsing exhaust gas (F2) with thermal decomposition equipment (4) by this, and occurs in a semi-conductor manufacture site. Furthermore, since heat recovery also becomes possible by the heat exchanger (3), power consumption of an electric heater (5) can be lessened and a running cost can be held down at a low price. Since the dust (17) in elevated-temperature pyrolysis exhaust gas (F3) is removable with spray equipment (7), dust (17) is not contained in the clarification exhaust gas (F4) by which atmospheric-air emission

is carried out but various component gas is moreover falling below to TLV by said processing, an environment is not spoiled by atmospheric-air emission. Moreover, since thermal decomposition equipment (4) or thermal decomposition equipment (4), and the dust (17) accumulated in the interior of a heat exchanger (3) are intermittently discharged with the dust exhaust (6), the lock out accident by dust (17) can be prevented, and it can work stably over a long time in continuous use.

[0015] Claim 4 is what limited the arrangement structure of a cylindrical heater (5), and the heating means of "thermal decomposition equipment (4) is formed at the cylindrical heater (5) crooked in the shape of U character. Two or more cylindrical heaters (5) are characterized by" thing arranged around the exhaust port of the rinsing exhaust gas (F2) by which the preheating was carried out by the heat exchanger (3) within casing (4a) of thermal decomposition equipment (4).

[0016] Thereby, unlike conventional method ** which used the cylinder heating heater, a cylindrical heater (5) can be contacted in direct rinsing exhaust gas (F2), high heat transfer to rinsing exhaust gas (F2) can be attained, it can be possible from small airflow to large airflow processing, and the various operation conditions of a semi-conductor manufacture site can be satisfied.

[Translation done.]

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EXAMPLE

[Example] Hereafter, this invention equipment is explained in full detail according to an illustration example. Drawing 1 is the outline sectional view showing the flow of this invention equipment. In drawing 1 , (1) is a water scrubber, it has connected with the semiconductor fabrication machines and equipment of works by the duct (14), it is used in the residual gas and the semi-conductor production process which were used in the semi-conductor production process, and the semi-conductor manufacture exhaust gas (F1) with which the exhaust gas which passed through the various chemical change gathered is introduced here.
[0018] The water scrubber (1) is set up on the water tank (12), and consists of the straight sections (1d) which follow the skirt-board section (1c) list in which the lower part has spread at the skirt-board section (1c) following the bosh section (1a) from which the lower part was extracted, the throat section (1b) following the bosh section (1a), and the straight section (1b). It is immersed in the reservoir water (12a) of said water tank (12) by the straight section (1d). The spray nozzle (1e) is installed in the head-lining part of the bosh section (1a), and injects water toward the throat section (1b).
[0019] The circulating water pump (10) is installed between the spray nozzle (1e) and the water tank (12), and the reservoir water (12a) in a water tank (12) is pumped up to a spray nozzle (1e). Moreover, a city water is supplied to said circulating water pump (10), and the reservoir water (12a) and said city water of a water tank (12) are mixed and pumped up.
[0020] It is installed in one on the heat exchanger (3), and both (3) and (4) adjoin a water scrubber (1), and thermal decomposition equipment (4) is installed on the water tank (12). The heat exchanger (3) is constituted from a heat insulator (13) ****(ed) by the periphery of cylindrical casing (3a) by the heat exchange body (3b) list contained inside cylindrical casing (3a) and cylindrical casing (3a), and the body of a heat exchanger implement (3b) is open for free passage with the straight section (1d) of a water scrubber (1) with the communicating tube (15).
[0021] Thermal decomposition equipment (4) consists of heat insulators (13) ****(ed) by the cylindrical heater (4b) list currently installed in cylindrical casing (4a) and casing (4a) at the periphery of cylindrical casing (4a). The upper limit opening part of said heat exchanger body (3b) is carrying out opening to a part for the core of the installation of a cylindrical heater (4b), and the rinsing exhaust gas (F2) by which the preheating was carried out is discharged by the thermal decomposition zone of a cylindrical heater (4b) installation part.
[0022] The dust exhaust (6) is the thing of the shape of a nozzle connected to the source of high pressure gas, and high-pressure jet gas (16) spouts it from the opening. Although inert gas like nitrogen gas will generally be used for the high pressure gas spurt out inside equipment when thermal decomposition exhaust gas (F3) reacts to the oxygen and the explosion target in air, air will be blown when it does not have explosivility. In this example, since thermal decomposition exhaust gas (F3) is already decomposed and it does not have explosivility, the compressed air is used. In this example, in the base opening partial list of the head-lining part of thermal decomposition equipment (4), an interstitial segment, and a heat exchanger (3), the installation of the dust exhaust (6) is the entry of spray equipment (7), and spouts compression jet gas (16) downward. The installation of the dust exhaust (6) is not restricted to an above location, but can install now only a number required for a need part.
[0023] Spray equipment (7) is installed in the head-lining part of a water tank (12), and the thermal decomposition exhaust gas (F3) which flowed in the water tank (12) from base opening of a heat exchanger (3) flows through the space between the head-lining part of a water tank (12), and the water surface. Spray equipment (7) has the structure where many baffles (7b) and spray nozzles (7a) were built in. The jet pipe (9) is installed in the outlet of spray equipment (7), and the ventilating fan (8) is installed in the middle.
[0024] As a semi-conductor manufacture exhaust gas (F1), although not restricted to this, of course, the simple substances of SiH2Cl2, gas like B-2 H6 and acidity like HCl, HF, and NH3, or basic gas or such at least two mixture are mentioned, for example as hydrolysis nature gas.

[0025] A deer is carried out, the semi-conductor manufacture exhaust gas (F1) discharged from the semi-conductor manufacturing facility is introduced into the bosh section (1a) through a duct (14), and the high-pressure water of the shape of a fog which blew off from the spray nozzle (1e) washes. Compression accelerating of the high-pressure water which blew off from the spray nozzle (1e) is carried out in a rat tail and the throat section (1b) in the bosh section (1a), a gas liquid contact is effectively made with semi-conductor manufacture exhaust gas (F1), and the water-soluble materials or the hydrolysis component in semi-conductor manufacture exhaust gas (F1) is decomposed in contact with spray water, or it is dissolved and removed.
[0026] Water supply to the spray nozzle (1e) of a water scrubber (1) is performed by pumping up the reservoir water (12a) in a water tank (12) with said circulating water pump (10). In this case, in SiH2Cl2 contained in semi-conductor manufacture exhaust gas (F1), while hydrolyzing and making HCl generate, it produces and cheats out of [SiH2O] X to coincidence, and it is absorbed by spray water. The treated water of a wastewater duct (11) to tales doses is eliminated from a water tank (12) to overflow or a pars basilaris ossis occipitalis, supplying always new water (city water) to a circulating water pump (10) to a water tank (12). In addition, air supply tubing (2) is inserted in the heat exchanger body (3b) of a heat exchanger (3) through the communicating tube (15) from the maintenance door (18) formed in the straight section (1d) of a water scrubber (1), and air required for oxidation thermal decomposition with an air supply pump (not shown) is supplied to washing exhaust gas, and it mixes. The concentration of the washing exhaust gas at this time (F2) is thinned below at the maximum allowable concentration of explosion.
[0027] Said air supply tubing (2) may be inserted to the entry part of a heat exchanger body (3b), as a continuous line shows, as an imaginary line shows, it may penetrate and arrange a heat exchanger body (3b), and you may make it mix air in the parts of the communicating tube (15) thru/or the straight section (1d) conversely. In order to make mixing of washing exhaust gas (F2) and air fully perform, it is good to mix by the straight section (1d) side, but if it thinks from the field of safety, it is desirable to penetrate and arrange a heat exchanger body (3b).
[0028] The rinsing exhaust gas (F2) washed with the water scrubber (1) enters in the heat exchanger body (3b) of a heat exchanger (3) via the communicating tube (15). Here, while being mixed with air as mentioned above, transfer of heat energy is performed through the container wall of the pyrolysis gas (F3) in which oxidative degradation was carried out by heating at high temperature with the thermal decomposition equipment (4) in the equipment upper part, and a heat exchanger body (3b), and where a preheating temperature up is carried out, it is discharged from upper limit opening of a heat exchanger body (3b), and goes into the oxidation thermal decomposition zone of thermal decomposition equipment (4).
[0029] As a heating means of this invention, the electric cylindrical heater (5) curved in the shape of [two or more] U character is used, along this front face, the washing exhaust gas (F2) processed descends, and a pyrolysis is carried out. The electric cylindrical heater (5) is curved in the shape of U character as mentioned above, since two or more cylindrical heaters (5) are arranged around the exhaust port of a heat exchanger body (3b) within casing (4a) of thermal decomposition equipment (4), contact to the washing exhaust gas (F2) by which the preheating was carried out to the electric cylindrical heater (5) is fully performed, and a pyrolysis completes it to the inside of a short time here. Therefore, the tooth space of an oxidation thermal decomposition zone can be made small.
[0030] The oxidized pyrolysis exhaust gas (F3) will generate a lot of dust (17), will be deposited on the periphery of the heat exchanger body (3b) with which this is installed under the periphery of an electric cylindrical heater (5), or the electric cylindrical heater (5), and it removes deposition dust (17) with the dust exhaust (6) so that it may mention later.
[0031] As mentioned above, rinsing exhaust gas (F2) descends toward a heat exchanger (3) from thermal decomposition equipment (4), generating a lot of dust (17) with advance of oxidation treatment, and heats the rinsing exhaust gas (F2) which is going up the inside of a heat exchanger body (3b) from the periphery through the container wall of a heat exchanger body (3b). Thus, the thermal decomposition exhaust gas (F3) which finished heat exchange enters in a water tank (12) from the opening of a heat exchanger (3), and is introduced in spray equipment (7) through the space between the head-lining side of a water tank (12), and the water surface. Installation of the decomposition exhaust gas (F3) to spray equipment (7) is performed by the suction effect of a ventilating fan (8).
[0032] Although said some of dust (17) carries out adhesion deposition into an electric cylindrical heater (5) and a heat exchanger (3), most descends with pyrolysis exhaust gas (F3), and the most pours and sinks on the reservoir water (12a) in a water tank (12).
[0033] It will rinse effectively with the water spray and the baffle (7b) from a spray nozzle (7a), and heat will be taken, and the decomposition exhaust gas (F3) containing the dust (17) introduced into spray equipment (7) will serve as low temperature, will turn into clarification low-temperature exhaust gas (F4), and atmospheric-air emission will be carried out from a jet pipe (9).
[0034] In addition, in this invention equipment, as mentioned above, oxide dust is generated mainly inside thermal

decomposition equipment (4), adhesion deposition is carried out inside thermal decomposition equipment (4) and a heat exchanger (3) with time amount, and there is a danger of blockading passage during an oxidation thermal decomposition reaction. The dust exhaust (6) formed in the high pressure gas injection nozzle as mentioned above as the cure is installed in the upper limit of thermal decomposition equipment (4), and the opening of a heat exchanger (3), high-pressure air or nitrogen gas can be intermittently blown off inside thermal decomposition equipment (4) and a heat exchanger (3), deposition dust (17) is dropped, and it drops into a water tank (12). The dropped dust (17) is usually fines-like, and although it is floating on the water front face at the beginning, it comes to distribute it in reservoir water (12a) with time amount. Some reservoir water (12a) in a water tank (12) is discharged out of a water tank (12) through a wastewater duct (11). In this case, a filter (not shown) is installed in front of a wastewater duct (11) if needed, and you may make it remove dust as a solid.

[0035] Moreover, with this invention equipment, rinsing exhaust gas (F2) can be beforehand heated by installation of a heat exchanger (3), heat recovery can become possible, and the heat energy burden placed on an electric heater (5) can be reduced sharply. When carrying out damage elimination processing of semi-conductor manufacture exhaust gas (F1) with this invention equipment, although the skin temperature of an electric heater (5) is set as 600-900 degrees C, by the heat exchanger (3), 20 - 30% of saving of use energy can be attained, and the running cost of semi-conductor manufacture can usually be reduced.

[0036] (Example of an experiment) As the ratio of the surface area / thermal decomposition zone wall surface area of an electric heater (5) was set as 1 and shown in the following table, it experimented in SiH4 of various concentration with various airflow. It checked that SiH4 could be eliminated below to the TLV in the following operating conditions to the designed damage elimination equipment in any case.

<<table 1>>

introductory SiH4 concentration Introductory gas all airflow (exhaust gas + air) Heater temperature Concentration of SiH4 in exhaust gas (ppm) (L/min) (degree C) (ppm) 500 1,000 850 <5 1,000 500 650 <5 3,000 1,000 900 <5 5,000 500 800 <5

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline sectional view showing the flow of one example of this invention equipment
[Description of Notations]
(F1) -- Semi-conductor manufacture exhaust gas
(F2) -- Rinsing exhaust gas
(F3) -- Pyrolysis exhaust gas
(F4) -- Clarification exhaust gas

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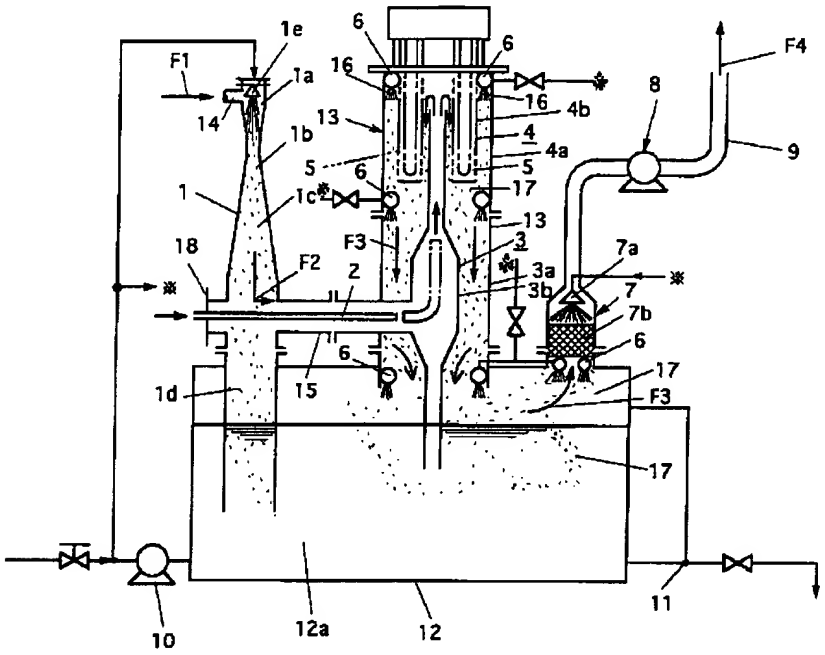
DRAWINGS

[Drawing 1]



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WRITTEN AMENDMENT

---------- [a procedure revision]
[Filing Date] July 6, Heisei 6
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] 0018
[Method of Amendment] Modification
[Proposed Amendment]
[0018] The water scrubber (1) is set up on the water tank (12), and consists of the straight sections (1d) which follow the skirt-board section (1c) list in which the lower part has spread at the skirt-board section (1c) following the bosh section (1a) from which the lower part was extracted, the throat section (1b) following the bosh section (1a), and the straight section (1d). It is immersed in the reservoir water (12a) of said water tank (12) by the straight section (1d). The spray nozzle (1e) is installed in the head-lining part of the bosh section (1a), and injects water toward the throat section (1b).
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0021
[Method of Amendment] Modification
[Proposed Amendment]
[0021] Thermal decomposition equipment (4) consists of heat insulators (13) ****(ed) by the cylindrical heater (4b) list currently installed in cylindrical casing (4a) and casing (4a) at the periphery of cylindrical casing (4a). The upper limit opening part of said heat exchanger body (3b) is carrying out opening to a part for the core of the installation of a cylindrical heater (5), and the rinsing exhaust gas (F2) by which the preheating was carried out is discharged by the thermal decomposition zone of a cylindrical heater (4b) installation part.

[Translation done.]